Annual Report of the Sanitary Board Bombay Presidency

1931-32 — 1938-39

For the Year ending 31st March 1932

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ANNUAL REPORT OF THE SANITARY BOARD FOR THE OFFICIAL YEAR ENDING 31st MARCH 1932.

The Sanitary Board came into existence in the early nineties at the instance of the Army Sanitary Commission for the purpose of advising local bodies on general sanitary improvements. It consisted of the Director of Public Health, then known as the Sanitary Commissioner and a senior Engineer Officer who came in 1892 to be styled "the Sanitary Engineer" and who subsequently became ex-officio Secretary of the Board. These officers toured round the Presidency and inspected and advised the local bodies with respect to sanitary improvements. The Sanitary Board's functions at present are briefly as follows:—

(*i*) Consideration of measures for effecting progress in sanitation in the Presidency and giving help and advice to local bodies on Public Health matters;

(*ii*) Scrutiny of Public Health improvement schemes and of their financial aspect, with a view to recommending their being undertaken by or on behalf of local bodies with or without help from Government;

(*iii*) Distribution of grants for minor sanitary schemes among the poorer Municipalities whenever Government places funds for the purpose at the Board's disposal.

The Board discharges these functions at meetings held at intervals during the year, any specially urgent questions being dealt with by circularising the members.

2. The Board is at present constituted as follows:—

The Commissioner, Central Division, as President, with the Superintending Engineer, Public Health, Bombay, as Secretary; the Secretary to Government, General Department; the Chief Engineer and Secretary (or Joint Secretary) to Government, Public Works Department (Roads and Buildings Branch); the Director of Public Health for the Government of Bombay; and one non-official as members.

3. The personnel during the year under report was as follows:—

President.

The Commissioner, Central Division, Poona—

A. W. W. Mackie, Esq., M.A., I.C.S. (up to 30th March 1932).
H. R. Clayton, Esq., M.A., C.I.E., I.C.S., J.P. (from 31st March 1932).

Members.

The Secretary to Government, General Department

R. B. Ewbank, Esq. C.I.E., B.A. (Oxon.), F.L.S., I.C.S., J.P. (up to 16th November 1931).
E. W. Perry, Esq., C.I.E., B.A. (Cantab.), J.P. (from 17th November 1931 to end of the year).

The Chief Engineer and Secretary to Government, Public Works Department—

D. R. H. Browne, Esq., O.B.E., A.K.C. (Lond.) (up to 22nd November 1931).

P. L. Bowers, Esq., C.I.E., M.C., A.M.Inst.C.E., J.P. (Joint Secretary) (from 23rd November 1931).

The Director of Public Health for the Government of Bombay—

Dr. Accacio da Gama, L.M. & S. (Bom.), D.P.H., D.T.M. & S. (Cantab.);

Diwan Bahadur K. R. Godbole, M.C.E. (Bom.), C.B.E. (non-official member).

Member and Secretary.

The Superintending Engineer, Public Health, Bombay—

A. P. Maddocks, Esq., B.Sc. (Birm.), M.Inst.C.E., M.Inst.W.E., M.I.E. (Ind.), F.R.San.I. (from 1st April to 24th April 1931 and from 18th July 1931 to end of the year).

V. G. Shete, Esq., L.C.E., M.I.E. (Ind.), M.R.San.I., A.M.I.San.I. (from 24th April to 18th July 1931).

4. The Board's executive functions are chiefly carried out by the Superintending Engineer, Public Health, Bombay, who advises upon the engineering and financial aspects of the proposed schemes of Public Health improvements and prepares and executes the majority of such projects when they are entrusted to Government agency for execution.

During the year, the Public Health Branch was constituted as under :—

(*i*) The Public Health Works Division, headquarters at Poona with six sanitary Sub-Divisions, viz. Sind, Gujarat, Khandesh, Thana, Sholapur and Belgaum, distributed all over the Presidency (including Sind) each with a Sub-Divisional Officer for investigation, preparation and execution of Public Health schemes. From 1st November 1931 the Salsette Water Supply Sub-Division under the Executive Engineer, Thana Division in the Northern Circle, was transferred to the Executive Engineer, Public Health Works Division, of this Branch and amalgamated with the Thana Sanitary Sub-Division—the amalgamated Sub-Division being called "the Thana Sanitary and Salsette Water Supply Sub-Division."

(*ii*) The Poona Water Works Division for carrying out the new capital and maintenance and repairs works in connection with Poona and Kirkee Water Works and the maintenance and repairs of the Bahiroba and Low Level Pumping Station of the Poona Drainage Works.

(*iii*) The Government Central Workshops at Dapuri, Kirkee, constituting another Division, for carrying out repairs to, with storage and upkeep of Government plant and machinery, the manufacture

of special castings etc. As the Boring Division under an Executive Engineer was abolished on 1st March 1931 and all the plants and machinery were transferred to the Government Central Workshops, leaving part of the plant at Ahmedabad under the Mechanical Overseer, the work of such borings only was undertaken as were urgent.

5. From January 1927 the Superintending Engineer, Public Health, has been carrying on the duties of the Mechanical Engineer to Government in addition to his other duties, having under him a small mechanical staff to assist him in the design, erection and inspection of pumping plants for water supply and drainage projects. Information regarding the working of sewage and water supply pumping plants throughout the Presidency is being collected by the Superintending Engineer in order that the Municipalities concerned may be advised with respect to their maintenance expenses and the efficient working of the plants.

6. A meeting of the Sanitary Board was held in Poona on the 20th of August 1931, when, amongst other important questions, the following were considered :—

(*i*) *Centage Charges.*—The Sanitary Board after full consideration resolved to recommend to Government the discontinuance of the payment of rebate to local bodies and to adopt for the present the following general policy in respect of giving grants-in-aid to cover centage charges :—

(*a*) full remission of centage charges in the case of drainage projects ;

(*b*) a grant of 18 per cent. out of the 28 per cent. centage charges on water supply schemes.

(*ii*) The Sanitary Board resolved that Government be advised under 3 (*a*) of the revised rules for the levy of centage charges to fix a separate centage charge (which might suitably be fixed for the present at 20 per cent.) for public health works carried out by the Public Health Branch.

(*iii*) The Sanitary Board resolved that a non-official member, preferably a member of the Legislative Council, should be appointed from 1st April 1932.

Accordingly Mr. Hoosenally M. Rahimtoola, B.A., M.L.C., J.P., has been appointed a member of the Board with effect from the above date.

(*iv*) The temporary lowering of the water of the Mutha-Mula river impounded above the Jamshetji bund at Poona was discussed, and it was resolved that if the Municipality desire on aesthetic grounds to have the water level temporarily lowered below the Potter's dam, the Board saw no objection to the opening of the existing sluice from May 20, 1932, until the break of the monsoon, as an experimental measure.

In addition to the several questions discussed at the above meeting of the Board certain other important questions were also dealt with by

circularising the members. In spite of the fact that Government was unable during the year to give substantial help by way of subventions to local bodies for public health works, the local bodies continued to evince a lively interest in public health works and found funds for them on a considerable scale from their own resources.

7. The works in progress during the year under report were as follows :--

WATER SUPPLY SCHEMES.

Ahmedabad.—The city of Ahmedabad has according to the 1931 census a population of 234,447, though it is to be noted that the correctness of this figure is doubted owing to the fact that the census operations were boycotted. The source of supply is the Sabarmati river. The supply derived from 18 infiltration wells, sunk in the bed of the river, about 2 miles upstream from the city at Dudheshwar, is conveyed through collecting pipes into pumping sumps on the river bank. Thence the water is pumped into elevated service reservoirs from which it is distributed through supply mains to the town. The town is continually growing and the works provided are proving inadequate to its needs. The Superintending Engineer, Public Health, has been advising the Municipality as to the most suitable methods of augmenting the supply, and as a result of this advice, the work of providing and laying 175 feet of 24″ porous pipes about 35 feet to 40 feet below the river bed for giving an additional supply of nearly one million gallons per day was completed at a gross expenditure of Rs. 55,799. The work was carried out by the staff of the Public Health Branch. Distribution pipes varying from 2″ to 6″ diameters were laid by the Municipal engineering staff at a cost of Rs. 67,820. The Municipality also contemplates undertaking the execution of the Kalupur Ward Water Distribution Scheme estimated to cost Rs. 2,38,679.

Alandi.—The scheme for supplying water to the pilgrims at Alandi during fairs estimated to cost Rs. 84,990 net was completed. The source of supply is the Indrayani river. The pumping plant consists of a crude oil engine and centrifugal pump in duplicate. The water pumped is conveyed to four service cisterns through C. I. rising mains. These service cisterns are situated at points near the different camping grounds of the pilgrims and supply water to horizontal service pipes placed round the cisterns and provided with push cocks. The pumping plant is capable of pumping 250,000 gallons in 12 hours, i.e. 2½ gallons per head for one lakh of pilgrims. The water pumped, filtered and distributed in the Karaiki fair amounted to 594,700 gallons. At the request of the Municipality, the following works were carried out by the Public Health Branch staff during the year under report :—

Laying 4″, 3″ and 2″ C. I. pipes to a length of 1,550 feet ; erection of two stand-posts and construction of a waste water drain for a length of 300 Rft.

The work is still in progress. The expenditure during the year was Rs. 4,520.

Hyderabad.—The town of Hyderabad (including Gidu, Transfuleli and other suburbs) has a population of approximately 95,930 according to the 1931 census. Its daily consumption ranges from about 2 million gallons per day in the winter to 3·6 million gallons in the hot weather.

(*i*) *Bazar Main.*—Owing to the increased consumption and the growth of a big suburb on the plateau known as the Hirabad Quarters between the Old Town and the Central Jail, the existing distribution mains were found to be extremely inadequate, both the supply of water and the pressure available having become unsatisfactory. The new main from the reservoirs in the fort to the north end of the plateau has been designed to provide a supply of 40 gallons per head per day for a prospective population of 101,699. The estimated net cost of the scheme is about Rs. 1,70,000. The scheme is divided into two parts—the first consisting of laying large new mains from the reservoir to the market, and the second of lifting the old mains in the market area and relaying them in the Hirabad Quarters. The Bazar main has now been completely laid and its extension towards the Hirabad Quarters is in progress. The new electrically driven plant having a capacity of 200,000 gallons per hour for high lift and 180,000 gallons for low lift for the Fort Lift Pumping Station, was installed and set to work. The work of the Bazar main reorganization consisting of replacing the existing main by mains 24″, 21″, 18″ and 15″ in diameter was completed for a total length of about 5,000 feet, by the Public Health Branch staff at a gross expenditure of Rs. 50,695.

(*ii*) *Improvements to Hyderabad Central Prison Water Supply.*—At the request of the Inspector-General of Prisons an estimate for providing a 6″ pipe connection to the 10″ Municipal main to supply water to the Prison population was drawn up and the work was partially carried out during the year under review by the staff of the Public Health Branch. The expenditure incurred during the year was Rs. 7,851.

Jacobabad.—The sub-soil water at Jacobabad is mostly brackish and the town has been in great need of a supply of sweet water. The project is divided into two stages, the first stage estimated to cost Rs. 2,15,000 net providing for a supply of 5 gallons per head to a population of 12,000. Two infiltration wells near the Nurwah canal flowing through the area known as Dickinson's forest form the source of supply. The flow of the Wah percolates through the neighbouring sub-soil and helps to drive down the salt in the sub-soil and render the sub-soil water potable. The water from the infiltration wells is pumped through a 6″ C. I. main 14,600 feet long into a covered elevated service tank in the town from which stand-posts are served. Extensions to the distribution system were completed during the year under review and all the works including the pumping station were handed over to the Municipality on 31st March 1932. The work was carried out by the staff of the Public Health Branch, the expenditure during the year being Rs. 22,452.

Jalgaon.—The Girna Water Supply Scheme estimated to cost Rs. 5,50,350 net has been completed, and handed over to the Municipality for maintenance. The water supply arrangements for the Jalgaon

Police Lines from this system were carried out by laying 4″ and 3″ mains 1,082 feet in length at a cost of Rs. 3,089. The work was carried out by the Public Health Branch staff.

Karachi.—The town of Karachi has a population of 260,639 according to the 1931 census. It derives its water supply from the sub-soil flow in the basin of the Malir river near Dumlottee. A long infiltration gallery about 3,500 feet long in the bed of this river above Dumlottee gorge discharges through a 30″ concrete pipe about a mile long into a gravitation masonry conduit about 24 miles in length leading to Karachi, and discharging into the "Temple" and "Curry" service reservoirs. The supply so obtained from the gravitation is supplemented for nearly 8 to 10 months of the year by pumping water into the same conduit from six infiltration wells within the vicinity of the river near Malir village about 8 miles below the site of the infiltration gallery.

During the year, the following works were carried out by the Municipal staff:—

1. A C.I. lining for pump well No. 7 was lowered to 80 feet depth.

2. A collecting well 48 feet diameter was excavated to a depth of 40 feet and cement concrete lined to a depth of 26 feet.

3. In No. 6 well, gathering tubes with screens were fitted under a depth of 77 feet of water by boring 9″ diameter holes in the $1\frac{1}{4}$″ thick lining plates, and the suction pipes from the pump well to a collecting well were lengthened,

4. A temporary well at the gorge was sunk in the hot weather for use with two 8″ and 6″ pumps to supplement the yield of the gallery. Expenditure Rs. 2,574.

5. It was decided to extend the gallery above the gorge and work was begun in February 1932. About 500 feet were laid during the year at a cost of Rs. 8,898.

From the service reservoirs the water is distributed through an evergrowing distribution system to the different parts of the town. Extensive improvements by adding 18,920 feet of mains 6″ to 4″ size to the water supply distribution system were carried out by the engineering staff of the Municipality. Investigations for finding out new sources of supply to meet the growing demand for water are being carried out. At the request of the Municipality an underground survey of the bed of the river Malir for a distance of about 4 miles above the gallery has been made by the Public Health Branch staff by means of borings in order to determine the practicability of increasing the gravitation supply from the Malir river. The investigations are still in progress.

Nandurbar.—Nandurbar has a population of 15,750 according to the 1931 census. A scheme for water supply estimated to cost Rs. 3,25,000 net for the first stage has been in progress and is nearly completed. At a distance of about 5 miles from the town there is a narrow gorge through which flows a perennial stream known as the Tokartala Nala, the flow of which is believed to be maintained by a large silted up basin behind

the gorge which absorbs and stores up a considerable part of the rain water falling into it. The flow as gauged during successive years was found to measure not less than 130,000 gallons a day in the hottest part of the year. This under the most unfavourable conditions gives a gravitation supply of between 8 and 9 gallons per head. A new pick-up weir has been constructed and the flow diverted into a gravitation main 19,500 feet in length supplying a service reservoir of 2·5 lakhs gallons capacity located on the hill overlooking the town known as the Mortuary Hill, from which the supply is distributed to the town. The following works in the first stage were completed during the year by the Public Health Branch staff :—

(*a*) The raising of the pick-up weir at Tokar Tala to its full designed height.

(*b*) A chlorination shed near the service reservoir.

(*c*) 3,507 feet of 4″ and 3″ distribution mains.

The expenditure during the year was Rs. 23,169. The supply to the public was commenced from April 1931.

Poona—(*i*) *Poona Cantonment Water Works.*—These Water Works supply the Cantonment and Suburban Municipal areas. The source of supply is the Mutha Right Bank Canal. The raw water is pumped into settling tanks with a total capacity of 5·9 million gallons. These tanks are drawn upon during the periodical canal closures for repairs and removal of weeds ; the prolonged period of storage normally provided by them serves to reduce the dose of alum required. From these tanks the settled water passes on to coagulating tanks, where the necessary dose of hydrate of alumina (normally about ¼ grain per gallon) is usually given. The settled water with its fine "floc" of alum is passed on to rapid filter units which are ten in number each with a capacity of approximately 300,000 gallons per day and one with a million gallons capacity. The filtered water after the addition of a dose of about 0·3 parts of chlorine per million parts of water is passed into a covered pure water reservoir with a capacity of approximately 1¼ million gallons, from which the supply passes by gravitation to the Low Service Zone or is pumped into one or other of the four covered service reservoirs serving the elevated service, high service, upper service and middle service zones. The pumping and distribution mains range from 21″ to 3″ in diameter, the total length being approximately 51 miles. A new Worthington Simpson horizontal triple expansion surface condensing steam engine, with a capacity for pumping 125,000 gallons of water per hour against a total head of 80 feet working with a steam pressure of 120 feet per square inch, provided in the last year, was installed and set to work to meet the increased demand for water in the middle service zone.

The pumping plant at the end of the year consisted of two raw water pumping units each for a specified supply of 3,000 gallons per minute and 40 feet lift and four pure water pumping units of which two units are for the elevated and high services (capacity 1,200 gallons per minute to 2,000 gallons) and two units are for the upper and middle services, one having a capacity of 2,080 gallons per minute for 80 feet lift and

the other of 1,000 gallons per minute for 75 feet lift. The pumps are all worked by steam supplied from four boilers.

The work of remodelling the Mutha Right Bank Canal to accelerate the emptying of the canal at times of canal closures and to impound water in the canal to meet the increased storage demand of the City and Cantonment Water Works has been in progress. The works were maintained throughout the year at high efficiency as regards quality. The quantity of water filtered and distributed during the period under report was 1,037,219,537 gallons. This works out to an average of 2·83 million gallons per day and about 64 gallons per head per day for all purposes. The average doze of perchloron is 4 lbs. per million gallons. The mean dose of alum works out at ·88 grains per gallon. During the rains the dose is 1·5 grains and during the dry season 0·5 grain per gallon. The total expenditure on maintenance and repairs, etc., incurred during the year was Rs. 2,41,920 including the expenditure on the prevention of the pollution of the canal. The revenue earned during the year was Rs. 3,72,993.

(*ii*) *Poona City.*—The supply is drawn from the Mutha Right Bank Canal by direct draw off and after aluming in the monsoon only and chlorination throughout the year it is distributed to the city area by a pipe system partly by gravity and partly by pumping for high level areas. The old distribution system which was laid about 50 years ago was partially remodelled in 1913–1915 and a further detailed scheme and an estimate, for the remodelling of the principal mains of the distribution system and the more important branches with additional service reservoirs for the high level areas, were supplied to the Municipality during 1929–30. The work was undertaken by the Municipality through its own agency. Details of lengths laid and expenditure incurred have not been reported by the Municipality.

(*iii*) *Kirkee Water Supply.*—These works were taken over by the Executive Engineer, Poona Water Works Division, on 1st April 1930. The maintenance and repairs of Kirkee Water Works, purchased by the Bombay Government from the Military Authorities at a cost of Rs. 5 lakhs, were carried out at a cost of Rs. 50,098. The water from Pashan Lake, pumped and delivered after treatment from 21st April to 20th July 1931, amounted to 47,441,750 gallons. The average dose of perchloron worked out at 8·2 lbs. per million gallons and that of alum during monsoon period to 4·1 grains per gallon. From 21st July 1931 to end of the year filtered water was supplied to Kirkee and Government House from Holkar's Bridge Water Works. This amounted to 128,572,710 gallons. The average dose of alum was 2·3 grains per gallon and that of perchloron was 4·7 lbs. per million gallons. It has been decided to use Pashan Lake raw water for the Government House gardens all the year round. The following extensive necessary improvements were also carried out during the year :—

(*a*) A new 15" gravitation main of concrete Hume pipes capable of bearing 75 lbs. pressure for conveying raw water from the Mutha Right Bank Canal to the Holkar's Bridge Water Works and designed to

discharge 1·3 million gallons per diem was laid complete for a length of 4½ miles. Expenditure Rs. 1,81,965.

(*b*) *Pashan Raw Water Mains.*—One of the two existing raw water mains (12″ and 10″) from the Pashan Tank to Government House was continued onwards from Government House to Holkar's Bridge Water Works by laying new 15″, 14″ and 12″ C. I. mains for a total length of 15,050 feet for conveying raw water from the Tank to the settling tanks at the Holkar's Bridge Water Works for use during canal closures. Expenditure Rs. 51,065.

(*c*) Two sets of engine and pumps each consisting of a Ruston Cold Starting Vertical Crude Oil engine of 112 B. H. P. driving via double Helical David Brown's gearing, a Mather and Platt two stage centrifugal pump discharging 1,050 gallons per minute against a total head of 180 feet were erected complete. These pumps deliver pure water into a new elevated service reservoir near the Ammunition Factory through a newly laid rising main of 12″ diameter and a total length of about 5,000 feet. Expenditure Rs. 46,850.

(*d*) An elevated service reservoir on steel staging 70 feet high with conical roof, 60 feet square, 12 feet deep, capacity 250,000 gallons was erected complete near the Ammunition Factory, Kirkee. Expenditure Rs. 51,728.

(*e*) Two additional combined filter units each 15 feet × 12 feet designed to filter 0·623 million gallons per day to supplement the existing three units were being installed. The total filtering capacity with the three old units of 18 feet × 10 feet now comes to 1·555 million gallons per day. The extension of the filter house is in progress. Expenditure Rs. 14,208.

(*f*) A new 15″ C. I. main from the service reservoir was laid and joined to the existing 9″ main which supplies water to the whole of Kirkee and Government House. A new 3″ diameter branch main of Everite pipes was laid to supply pure water to Chikhalwadi as also a 4″ and 3″ main for Bopodi villages, both places near Kirkee, to avoid the infection by water borne disease of the Kirkee population and Government House employees. Expenditure Rs. 8,222.

(*g*) Some other miscellaneous works out of the improvements scheme were also carried out. These consisted of providing 12″, 9″ and 6″ mains, removing the old 9″ main and converting the old boiler house into Engineer's quarters, etc. The net expenditure incurred during the year on all the Kirkee improvements was Rs. 3,70,513. The revenue earned during the year was Rs. 95,204, exclusive of water charges to Government House.

Salsette and Ambernath Water Supplies.—The maintenance and repairs of these Water Works were transferred to the Public Health Branch from the Superintending Engineer, Northern Circle, with effect from 1st of November 1931. These are two out of 26 Bombay Development Suburban schemes and are numbered 19 and 21 respectively.

S.S. 19 comprises the following localities which are being served with water :—

(1) Khar, (2) Santa Cruz, (3) Kurla, (4) Vile Parle, (5) Juhu, (6) Bandra, (7) Andheri, (8) Versova, (9) Amboli, (10) Trombay, (11) Ghatkopar, (12) Mulund and (13) Miscellaneous direct connections.

S.S. 21 comprises the following localities :—

(1) Ambernath, (2) Badlapur, (3) Kulgaon and miscellaneous direc connections.

The administration of S.S. 19 consists in supplying water to the various localities by purchasing the bulk supply from the Bombay Municipality. The total revenue realised from these two works during the year under report was Rs. 4,65,000.

Sholapur.—The City of Sholapur has now a population of 135,632 according to the 1931 census. Its source of supply is the Ekruk Tank, about 6 miles from the city. Two gravitation mains 15″ and 12″ on which a common Venturi Meter to measure the supply has been provided, lead the water to small settling tanks, in effect a balancing tank, near the pumping station on the north side of the town. From the pumping station the water is raised through a rising main partly 15″ and partly 12″ in diameter to service reservoirs serving the different zones of the city. Both the quantity of water supplied and the pressure in the mains have proved inadequate and considerable improvements and enlargements of the works are urgently needed and these are being carried out in stages. The improvements in the urgent stage, consisting of the construction of a new engine house and sump pit, the erection of a new pumping plant and replacing the old rising main by 24″ pipes for 4,878′ of its length, were completed before the year under report. The second stage of the work provides for replacing the remaining portion of the rising main, 5,900′ in length, out of which 2,600′ were completed during the year and the work is in progress. The third stage provides for replacing the two old 15″ and 12″ gravitation mains from Ekruk Tank to the town by one main 33″ in size, 5,822 feet long, followed by a 30″ main, 7,165 feet long. Pipes for this stage of the work were being received, tested and carted to site. The total expenditure on the improvements amounted to Rs. 88,715.

Surat.—The City of Surat with a population of 97,063 according to the 1931 census (but here too the census figures are probably inaccurate and the real figure may be about 120,000) derives its water supply from the river Tapti on which river the head works are situated at Warachha, 5 miles upstream above the normal reach of the tidal water. From a number of interconnected infiltration wells and 510 feet of porous pipe gallery laid in the bed of the river, two C. I. mains 24″ and 22″ in diameter convey the water to the sump of the pumping station situated on the river bank. Three sets of steam engines and pumps raise the water to two elevated circular steel tanks near the engine house. A 22″ supply main, three miles long, conveys the supply from the elevated tanks to the distribution mains. The provision of the porous pipe gallery has increased the

yield from the head works so that it is sufficient to cope with the increased requirements of the city during the hot weather, provided the summer flow of the river maintains a good sub-soil water level above the pipe gallery. The distribution system, particularly the trunk main, being unsuited to present requirements, is being remodelled in stages. The first stage from Murdha Gate to Lal Gate consists in laying new mains from 33″ to 24″ in diameter for a length of 7,264 feet. This was completed by the end of September. The second stage—the provision of 21″ and 20″ old salved mains from Lal Gate to Chowk was completed for a length of 2,242 feet out of a total of 2,624 feet. A new chloronome was also installed at the Warachha Head Works. The work was carried out by the Public Health Branch staff. The expenditure during the year was Rs. 65,608.

Miscellaneous Works.—Besides carrying out and supervising the above major works, the Public Health Branch has been carrying on other minor contribution works such as the work of extensions to the distribution system at Matheran, repairs to the Pokhran Dam at Thana, raising the F. S. L. of the Anandwalli weir at Nasik, and clearing the silt from the bed of the Gangasagar Tank at Trimbak, etc. It has also been entrusted with the maintenance and repairs of pumping stations at Kapadvanj, Uran, Matheran, Pandharpur, Karad, Satara, Dharwar Police Lines and Shingnapur. The maintenance of the Ratnagiri Water Works was transferred from the Public Works Department to the Public Health Branch from 1st November 1931. The old 7″ steel gravitation main of these works which was much pitted throughout its length was replaced by 9″ Hume pressure pipes, this work being completed for a length of 13,263 feet in three months from December to the end of March. The expenditure on account of the maintenance of all these works during the year amounted to Rs. 64,411.

Boring Operations.

The old Boring Division being closed from 1st March 1931 its work was transferred to the Executive Mechanical Engineer and Works Manager, Dapuri Workshops, with the reduced establishment of one Overseer and a fitter. The following minor works were undertaken by the Boring staff during the year under report:—

(1) Testing the output and recuperation of three bore holes at Broach.

(2) Testing a well at Ahmedabad.

The work of putting down 8 bore holes for Kurundwad State was undertaken. Of these one was in progress during the year under report.

Drainage Works.

Ahmedabad.—The City is provided with underground sewers, the sewage gravitating to a pumping station outside the Jamalpur Gate whence duplicate sets of engines and pumps raise it through a rising main to a sewage farm at present 358 acres in extent and shortly to be increased to 700 acres, for disposal by irrigation. Extensions consisting

of laying 8″ stoneware pipes for a length of 5,000 feet 6″ stoneware pipes for a length of 24,000 feet, 1,333 house connections and the erection of 91 ventilating columns were carried out by the engineering staff of the Municipality at a cost of Rs. 1,96,232. Government were advised in connection with the development of the sewage farm so as to ensure that no sewage should overflow into the river directly. The Municipality has laid out as an experimental measure an area of 1·25 acres for intermittent downward infiltration with a net work of open jointed pipes to dispose of sewage before discharge into the river. The experiment has so far proved successful.

Belgaum.—The town is not at present provided with any piped water supply, but is dependent on wells distributed throughout the town. A main drainage scheme has however been found necessary and a scheme has accordingly been drawn up for providing new surface drains and three main collecting drains conveying the sullage to settling tanks, the effluent from which will be disposed of by irrigation. The work of the second stage of the scheme was in progress. Stoneware sewers 12″ in diameter for a total length of 2,950 feet and 15″ sewers for a length of 562 feet were laid complete. A settling tank in two compartments was also constructed. The expenditure incurred during the year was Rs. 23,068.

Dhulia.—A partial drainage scheme for conveying the sullage by gravitation from the existing surface drains of the town through underground pipe drains to a common outfall and thence to a settling tank has been in progress and is now nearing completion. Two main underground drains, one running alongside of the natural drainage channel known as the Hagra Nala and the other along the west side of the town, join at the north-east corner of the town, and from this junction the outfall main conveys the sullage to settling tanks on the right bank of the Hagra Nala below the town. A 15″ stoneware pipe main conveys the effluent to the irrigation farm. During the year under review the remaining work of the third stage of the scheme—the disposal works—consisting of a 15″ effluent carrier, an effluent channel and a sewage farm was carried out. The expenditure incurred during the year was Rs. 10,337.

Gadag Bettigeri.—An extensive surface drainage improvement scheme has been in progress. Most of the sullage flows into a nala known as the Javal Nala. Suitable V shaped surface drains to take the sullage and storm water at the rate of $\frac{1}{4}$″ run-off per hour are being provided and the existing main drain in the nala has been improved and extended to below the railway bridge. It is proposed also to divert the sullage flow from the nala into an underground pipe drain and to lead it by gravitation to the effluent irrigation area. The estimated cost of the scheme in its different stages amounts to Rs. 1,40,783 net. The work—the first and second stages consisting of the laying of No. 21 drain for a length of 1,000 feet and of drains of different types for a length of 24,398 feet was undertaken and completed. The expenditure during the year was Rs. 21,555. The

third stage of the works has not been started and is to be redesigned and resanctioned as the revised estimates show that the cost would greatly exceed the sanctioned provision.

Karachi.—The City is served by a water carriage system of underground drainage. The town area is flat and numerous ejector stations are provided. The sewage is lifted through a common rising main to a Municipal sewage farm 210 acres in extent where it is disposed of by irrigation. The net revenue from the farm amounts approximately to Rs. 30,000 per annum. Extensive improvements to the drainage works consisting of making cement concrete rings for 30 manholes in the Lyari Quarter, sinking Ejector No. 17 in the Artillery Maidan and laying Hume reinforced concrete pipe sewers of various diameters to a total length of 72,955 Rft. were carried out by the Engineering staff of the Municipality. The expenditure incurred during the year was Rs. 3,02,647.

Nasik Road Central Prison.—A Drainage scheme consisting of a modern water carriage system with suitable internal sanitary fittings, underground pipe drains, settling tank and sewage farm has been in progress. The estimated net cost of the scheme is Rs. 1,65,300 and the work carried out by the Public Health Branch staff is now complete. Storm water drains within the prison walls were laid for a length of 5,558 feet at a cost of Rs. 17,618 during the year under review.

Poona.—The Poona Drainage Improvement scheme has been in progress during the year under review. For purposes of administration and finance, the project under execution estimated to cost Rs. 44,25,016 net is divided into two sections. The *first section* includes the following works:—

(1) The completion of branch and lateral sewers in the city area.

(2) The reconstruction of the low level pumping station (with small subsidiary stations for other low level areas).

(3) The construction of an egg-shaped outfall sewer, 18,675 feet long varying in sizes from 3 feet by 2 feet to 5 feet by 3 feet from Daruwala Bridge along the right bank of the Mutha and Mutha Mula rivers to an outfall pumping station near the junction of the Bahiroba Nala and the Mutha Mula river. (Provision is made for reception *en route* into this, of the sewage of the Poona Cantonment Authority, the Railways and the Poona Suburban Municipality).

(4) Settling and Balancing tanks with screens and grit elevators,

The *second section* includes:—

(1) the outfall pumping station,

(2) the rising mains, and

(3) the necessary works in the effluent irrigation area.

The works that were in progress during the year under report are described below :—

First Section.—Stoneware pipe sewers, 6″ to 15″ in size and 3,613 feet in length were laid complete with 75 house connections in Nana and Bhavani Peths. The work of constructing a sump pit and the erection of a new engine and pump house for the low level area were completed and the pumping of low level sewage started by the end of the year. Plans and estimates for the remaining scattered low level areas were prepared and arrangements made to start these works. The extension of the sewer lines in District Nos. 1, 2, 4, 5 and 6 mainly consisting of the laying of new stoneware pipe sewers 6″ and the replacement of old 4″ laterals by 6″ sewers to a total length of 11,584 feet as well as the construction of 12 public latrines on the flushing system with one pail depot were carried out by the Municipal Engineering staff under the supervision of the Executive Engineer, Public Health Works Division. The expenditure during the year incurred on all these works amounted to Rs. 2,73,896 and on the whole of the first section to Rs. 18,78,312 gross.

Second Section.—The work of providing a third pumping unit in the Bahiroba pumping station was completed. The effluent irrigation works and the drinking water supply arrangements to the vasties (scattered residences of cultivators) in the effluent area were completed and handed over to the Irrigation Department. The expenditure during the year on all these works amounted to Rs. 49,009. The total cost of second section up to date is Rs. 16,30,144.

The maintenance and repairs work of the Poona Drainage Outfall works, the Bahiroba Pumping Station, Pumping Main, etc., were carried out at a cost of Rs. 59,280. The quantity of sewage pumped during the year was 1,339,846,000 gallons or an average of 3·67 million gallons per day. The sewage was disposed of by irrigation on land commanded by distributaries Nos. 5 and 6 of the Mutha Right Bank Canal.

Poona Cantonment.—Proposals for a partial scheme estimated to cost Rs. 2,33,440 were prepared by the Public Health Branch and were under consideration of the Poona Cantonment Board.

Poona Suburban Municipal Internal Drainage.—The Poona Suburban Municipality has entrusted the execution of its internal drainage works to the Public Health Branch. The Suburban area to the east of the Mula river is divided into three drainage districts Nos. 10, 11C and 11D ; the work in district No. 10 is to be taken up in three stages being dependent upon the Cantonment Board joining the general system. The sewers in the first stage of district No. 10 which were commenced last year were completed this year and handed over to the Municipality for maintenance and the work of laying sewers in districts 11C and 11D for a length of 5,633 feet was completed. Expenditure Rs. 15,370.

Shikarpur.—The town of Shikarpur has a population of 62,000 according to the 1931 census. The "partial" scheme works begun last year

were in progress and sewer pipes laid for a length of 1,858 feet. Possession of the land for the pumping station was obtained during the year and quarters for a chowkidar erected with a tube well for water supply. Rising main pipes were ordered and were being received. The expenditure during the year was Rs. 49,257. The work was carried out by the Public Health Branch staff.

Surat.—A scheme of complete underground drainage costing about Rs. 40 lakhs and proposed to be taken up in stages was revised by the Superintending Engineer, Public Health, and submitted for the consideration of the Municipality. This is still waiting to be financed. In the meantime certain improvements of the sanitary conditions of the thickly populated area through which the main natural drainage channel locally known as "Khadi" flows to join the river through the Makai creek were considered urgent, the cost of these works being estimated at Rs. 81,000 net, for the first stage. A beginning was made with this work by the Public Health Branch staff, but it was held up pending consideration of the major scheme of drainage. The second stage providing for an outfall sewer and a main pumping station was designed and estimated to cost Rs. 6,02,650 gross. The scheme and estimate were submitted to Government and are awaiting their sanction.

8. In addition to the construction works in progress the Public Health Branch staff which was supplemented by work-charged men according to the necessity of works was engaged during the year on survey and project work. About 21 schemes estimated to cost Rs. 33,64,672 were investigated during the year under report, the more important of them being the following:—

(1) Hyderabad Drainage, first stage works, Parts I and II.

(2) Improvements to Surat Water Supply, third stage.

(3) Surat Drainage project, urgent stage.

(4) Khadi drainage works at Surat, first stage.

(5) Providing filtration plant at Matheran.

(6) Khed Water Supply.

(7) Improvements to Nasik Water Supply.

(8) Improvements to Sholapur Water Supply.

(9) Improvements to Kurla Water Supply.

(10) Improvements to Ahmedabad Water Supply.

9. The total cost of new construction works carried out by the Public Health Branch amounted to Rs. 4,00,125 and the cost of maintenance and repairs works in charge of the Public Health Branch amounted to Rs. 3,45,965. The revenue realised from Government sanitary works under the Branch amounted to Rs. 5,70,745 and that realised in the Irrigation Circle for public health works amounted to Rs. 49,663.

The total cost of the establishment during the year was Rs. 3,11,030 excluding the cost of the establishment for the Government Central Workshops, Dapuri.

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Government gave help to local bodies by way of grants-in-aid to cover the cost of centage charges and part cost of capital works to the extent of Rs. 2,90,036 while they also gave rebate grants to the extent of Rs. 20,014.

10. The total number of Municipalities in Bombay Presidency was 154, out of which 47 have got public water supplies with proper pipe distribution systems. Of these again—

21 are pumping schemes,
2 are part pumping and part gravitation schemes,
2 are on borehole supplies, and
22 are fully gravitation schemes.

The total income of the Municipalities from these works for the year under report is not yet known but the figures for 1930-31 are given below to show what amount of work has to be watched by this Branch :—

The total income from water rates in 1930-31 was Rs. 35,26,829 and the total maintenance and repair charges were Rs. 14,99,502.

Similarly there are 11 local bodies excluding the Bombay Corporation in the Presidency which have installed regular drainage schemes, either wholly or partially underground and there are 10 local bodies which have installed surface drainage schemes with or without proper outfall disposal works.

There is very large room for progress in providing these amenities of life and indirectly helping in raising the standard of health throughout the Presidency.

11. The post of the Superintending Engineer, Public Health, Bombay, continued to be held by Mr. A. P. Maddocks, B.Sc., M.Inst.C.E., M.Inst.W.E., M.I.E. (Ind.), F.R.San.I., from 1st April 1931 to 24th April 1931 and from 18th July 1931 to end of the year. During the period of Mr. Maddocks' absence on leave, Mr. V. G. Shete, L.C.E., M.I.E. (Ind.), M.R.San.I., A.M.I.San.E., acted for him, i.e. from 25th April 1931 to 17th July 1931. The charge of the Public Health Works Division was held by Mr. V. G. Shete, L.C.E., M.I.E. (Ind.), M.R.San.I., A.M.I.San.E., from 1st April 1931 to 24th April 1931 and from 18th July 1931 to end of the year. During the intervening period, Mr. N. K. Joglekar, L.C.E., Assistant Engineer, acted for him, i.e. from 25th April 1931 to 17th July 1931. The charge of the Poona Water Works Division was held by Mr. R. A. Collett, A.M.I.C.E., and the charge of the Government Central Store and Workshop, Dapuri, by Mr. C. Holliman, A.M.I.Mech.E.

V. G. SHETE,
Secretary, Sanitary Board,
Bombay Presidency.

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